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Cover

This photograph taken from a helicopter shows the construction underway on Shuttle facilities at the Flight Research Center. Almost half the towway has been finished. The site of the mating device is visible at right, with excavation for the new hangar in the center. All work, including that on the hangar, is expected to be completed by Aug. 15, 1976.

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Greetings and Sincere Good Wishes

to

All NASA Personnel and their Families
for a
Joyous and Rewarding 1976, the Bicentennial
Year of the United States of America

James C. Fletcher

George M. Low

Monthly NASA Highlights

U.S./USSR Cooperative Biological Satellite Launched

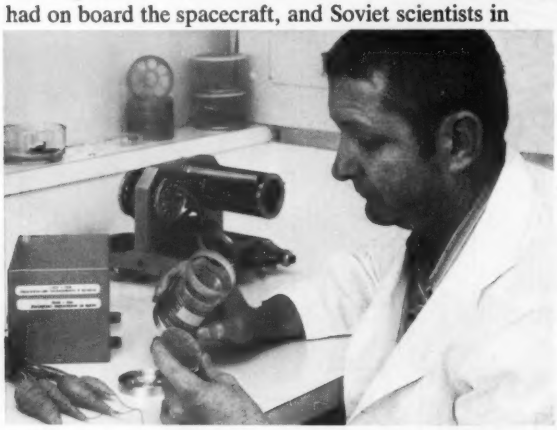
The launch of a USSR biological satellite in November was the start of a 22-day cooperative venture in space between the United States and the Soviet Union. For the first time, American biological experiments were flown aboard an unmanned Soviet spacecraft.

During the fifth meeting of the U.S./USSR Working Group on Space Biology and Medicine, held in Tashkent in 1974, the Soviet Union invited the United States to participate in a biological satellite mission. The U.S. accepted this invitation and developed four life sciences experiments which were placed on board the spacecraft along with the Soviet experiments. Had this opportunity not occurred, U.S. biology payloads and weightlessness experiments would not have been flown until the 1980s, when the Space Shuttle becomes operational.

The U.S. experiments were autonomous from the spacecraft power, telemetry and data recording. Passive scientific instruments were housed in five containers fabricated by the Soviet Union.

The cooperative effort continued after recovery of the biological payload. American scientists were invited to participate in post-flight investigations using bone and tissue specimens from rats and fruit flies which the Soviet had on board the spacecraft, and Soviet scientists in return were invited to participate in analyses of U.S. specimens.

Officials of both countries are investigating the possibilities of conducting further joint biological flights.



Spotlight on the Humble Carrot—Dr. Richard Simmonds, a project manager for U.S. participation in a Soviet satellite mission, holds an engineering model of a capsule housing a biological experiment to study the effect of weightlessness on carrot tissue cell growth. The carrot experiments were two of four U.S. experiments flown on a USSR spacecraft recently.

QCSEE Engines to Be Tested During 1976

Future short-haul aircraft will require high lift devices in order to meet the requirements for short takeoff and landing distances. The Quiet, Clean, Short-Haul Experimental Engine (QCSEE) program in the Aeronautical Propulsion Division of the Office of Aeronautics and Space Technology was initiated to provide the technology associated with the propulsion element of the short-haul aircraft system.

The objective of the QCSEE program is to explore and consolidate the technology for quiet, clean, powered lift propulsion systems applicable to future externally blown (FEB) short-haul aircraft. The program has been structured to permit melding of previous analyses, design and test efforts into a total propulsion system using credible full-scale experimental hardware.

Primary system constraints are low noise and low exhaust emissions, while maintaining high operating efficiency. Although QCSEE is not intended to be flown, the propulsion systems are designed for flight operation except in specific areas where non-flight hardware can be used to save costs without compromising program objectives.

A contract was awarded the General Electric Co. in December, 1973, to design, build and test two propulsion systems, one for under-the-wing (UTW) and the other for over-the-wing (OTW) FEB installations. These engines will include high bypass ratio gear-driven fans appropriate to each application. The UTW system will also include variable pitch fan blades for rapid thrust modulation and a thrust reversing capability.

Extensive use will be made of advanced composite materials in major components such as the fan blades, fan frame and nacelle. Noise suppression techniques will be incorporated in the basic system design, including a near sonic inlet. Both systems will use the existing advanced technology core developed for the F101 engine.

The General Electric Co. has completed design of both propulsion systems and is currently proceeding with fabrication of component hardware. Both systems will be placed on test at the contractor's facility during 1976 and subsequently delivered to Lewis Research Center for further testing with appropriate wing/flap systems.

These test demonstrations of component and system interactions in credible, full-scale engines and propulsion installations will establish the data base to stimulate industry development with acceptable risk and to help government establish environmental and operational requirements.

Atmosphere Explorer Launch Successful

The Atmosphere Explorer-E (AE-E) spacecraft was successfully launched during November by a Delta launch vehicle from the Eastern Test Range. It is the third in a series of maneuverable, unmanned spacecraft to study the upper atmosphere, including Earth's protective ozone layer.

The AE-E spacecraft are equipped with an onboard propulsion system which permits excursions into the largely unexplored region of the lower thermosphere. It is in this region where the bulk of the solar energy is absorbed and where most of the chemical and energy conversion processes occur which govern the structure and properties of the upper atmosphere.

The AE-E spacecraft carries 12 scientific instruments designed to return information on the Earth's heat balance and energy conversion mechanisms, as well as the flow of heat or energy from one hemisphere to the other. One of the instruments is a Backscatter Ultraviolet Spectrometer (BUS) designed to measure the atmospheric distribution of ozone in the equatorial region. This instrument was added to the spacecraft's payload last spring as part of NASA's continuing program to measure the atmospheric distribution of ozone on a global scale.

Women's Program Coordinator Named at FRC

Margaret Ashworth

Margaret Ashworth of the Office of the Director has been appointed Federal Women's Program Coordinator at the Flight Research Center by its Director, Dr. David R. Scott.

As Coordinator, Ms. Ashworth will be involved in encouraging women to discover their own unique capabilities and talents and bring them to the attention of NASA and the community. Her activities will be a part of NASA's Equal Opportunity Program.

Ms. Ashworth said following her appointment that she feels the Federal Women's Program is an attempt to help women find potential in positions that are interesting and challenging and which may be quite different from the current stereotype of "a woman's place." She plans to have guest speakers, panelists and possibly workshops in the future to help work toward the goals of the program.

■ ■ ■

Spanish-Speaking Program Coordinators Meet—For the first time, the Council of Spanish-Speaking Program Coordinators (SSPC) met recently at the Flight Research Center. Among those in attendance, as photographed here, were, left to right, Dora Barjon, FRC coordinator and hostess for the meeting; Alfonse Ludi, deom NASA Headquarters, principal speaker; Louis Perez, Job Information Center Director, Civil Service Commission, Los Angeles; Al Montez, Chairman; Hermilio Gloria, Equal Opportunity representation of the CSC, San Francisco; and Fidel Rul, Deputy Director of the Goldstone Tracking Station.

MSFC Increases CFC Participation

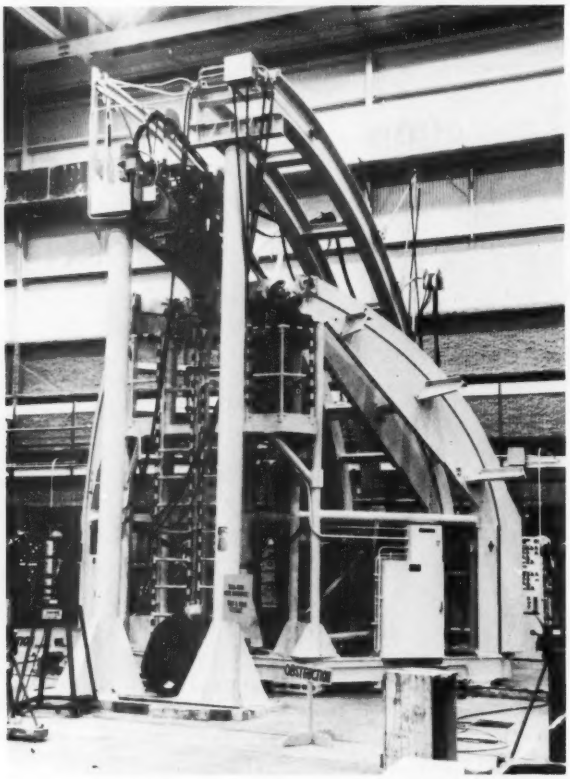
The Marshall Space Flight Center's 1976 Combined Federal Campaign ended with 96 percent of all employees contributing, representing a one percent increase over last year's drive.

This year's average gift was $47.83, slightly higher than last year's average of $47.20. Because fewer employees were on board at MSFC this year, the grand total of pledges and cash received during the drive, $181,266, was some $7,000 below last year's total.

Shuttle Tank Work Is Underway

Engineers have found that tooling-up for manufacturing the Space Shuttle's External Tank (ET) is a challenging enterprise from the standpoints of precision, automation, and sheer size. The Martin Marietta Aerospace Co. is under contract to the Marshall Space Flight Center to produce the expendable ET, a structure 8.38 meters (27.5 feet) in diameter and 46.93 m. (154 ft.) in length.

Some of the fixtures at MSFC's Michoud Assembly Facility in New Orleans, the assembly site, are more than half the length of a football field and several stories high.



Gear for Shuttle Tank Production—This fixture recently installed at MSFC's Michoud Assembly Facility will be used for holding three stretch-formed gore panels and welding them into a propellant tank quarter dome for the Space Shuttle External Tank. Use of the fixture began in September with the first production type welds by Martin Marietta.

The manufacturing operations will require the use of 364 special tools, of which 34 are major fixtures. About 50 percent of the tooling activity has been completed and all other required items should be ready for use in the spring of 1976.

The main manufacturing area of the Michoud plant encompasses 43 acres under one roof. Built during World War II, the plant has echoed to the sounds of the production of cargo planes, engines for military tanks and boosters for the Saturn launch vehicle. Now the plant is almost ready to produce second-generation space hardware.

Work Proceeds on Ground Vibration Test Facility for Space Shuttle

The Saturn V dynamic test stand at the Marshall Space Flight Center, a 405-foot-tall structure used during the Apollo program, is being modified to provide a Space Shuttle facility for ground vibration testing. Structural modifications to the facility include enlarging the existing test bay and relocating a 175-ton derrick.

The Space Shuttle will be tested dynamically in the launch configuration (orbiter, external tank and two solid rocket boosters) and in the boost configuration (orbiter and external tank). Tests will be conducted to determine the bending modes and dynamic response during launch and ascent conditions.

Results of the several tests will help to verify the Shuttle analytical (math) model. The verified model will serve as a basis for determining, by extrapolation, the geodynamic loads; flutter; the shimmy effect called POGO, associated with different mission configurations; and for flight control analyses.

The Army Corps of Engineers awarded a $1,923,400 contract to Universal Construction Company of Decatur, AL, to convert the structure. Completion of the work is scheduled for mid-February, 1977, and the Shuttle vehicle installation is set for April, 1978.

Related work to begin in January, 1975, includes modifications at Redstone Airfield (Alabama) for off-loading the Space Shuttle orbiter from a specially modified Boeing-747 ferry plane, and widening some of the roadways between the airfield and the test stand.

Ms. Harris Cites Better Hiring Policies at NASA

"Through NASA's Technology Utilization Program, space-generated ideas are converted into thousands of products, processes or services that improve the quality of life," said Ruth Bates Harris, NASA's Deputy Assistant Administrator for Public Affairs for Community and Human Relations, in a recent statement entitled "A New Look at the Space Program from Planet Earth."

After reviewing the benefits and accomplishments of the space program, she pointed out that a number of minority organizations have benefited from the ideas that are disseminated to federal, state, commercial, and professional outlets through NASA's six Industrial Application Centers.

Harris mentioned Alcorn State University, a predominantly black institution in Mississippi that received a NASA grant for studies on radio tracking and geostationary satellites; Louisiana's Grambling College, given a grant for the study of effects of irradiation on animal tissue; a Sunnyvale, CA, minority business firm with contracts running close to a million dollars for providing technical support to NASA computer projects; and a recent award of $1.23 million to a District of Columbia contractor.

She added that opportunities for employment within NASA for minorities and women have been on the upturn compared with the less encouraging situation of past years.

"And, while there is not the large number of jobs available now as there was in earlier years," she said, "opportunities continue in such disciplines as systems management, law, public affairs, university affairs, international affairs, procurement, administration, technology utilization, aeronautics and space technology * * * and many, many others. * * * In fact, there are no positions in NASA where the qualifications can be determined by race or sex or other irrelevant factors."

Shuttle Runway Paving Completed at KSC

As part of the reshaping of Kennedy Space Center's Complex 39 to meet the needs of the Space Shuttle era, paving of the Orbiter Landing Facility, which began in May, has been completed with the pouring of the last of the 252,000 cubic yards of concrete required.

The massive paving project includes a 15,000-foot-long, 300-foot-wide runway with 1,000-foot overruns at each end, a 30,000-square-yard parking apron, a 9,150-foot towway from the runway to the vicinity of the Vehicle Assembly Building (VAB), and a 650-foot taxiway from the towway to the apron.

Runway thickness is 16 inches at the center, tapering to 15 inches on the sides. The concrete rests on a six-inch-thick base of soil cement.

The Landing Facility is being built northwest of the VAB on a northwest-southwest alignment. Work still to be completed under Phase 1 construction includes sealing the concrete joints with neoprene, stabilization of runway shoulders, and grooving of the concrete runway to prevent hydroplaning of flight vehicles operating under wet weather conditions.

Where Shuttle Will Land—This aerial view of the 15,000-foot-long Space Shuttle Orbiter Landing Facility was taken on Oct. 16, five days prior to completion of the paving operating. It extends to the southeast. Visible in the background is the KSC Vehicle Assembly Building.

The grooves will be cut on one-and-one-eighth-inch centers and be one-quarter inch deep and one-quarter inch wide.

The 252,000 cubic yards of concrete used in the project equals 6.8 million cubic feet, or more than one-twentieth of the volume of the 129 million cubic feet in the VAB, one of the world's largest structures.

The paving was done by J. W. Vickrey Enterprises, Inc., of Dixon, CA, which has the $21,812,737 prime contract for Phase I of the Orbiter Landing Facility construction.

Naugle Named NASA Associate Administrator

Dr. John E. Naugle, who has served as Associate Administrator of NASA since Dr. Rocco Petrone left in April, 1975, has been appointed permanently to that office.

As Associate Administrator, he is responsible for the overall planning and management of work conducted by the Offices of Applications, Aeronautics and Space Technology, Space Science, and Tracking and Data Acquisition. Except for the Office of Space Flight, which reports directly to the Deputy Administrator, Naugle has the responsibility of directing the research, development and operational activities conducted by the agency.

His NASA service began in 1959 when he became

head of the Nuclear Emulsion Section at Goddard Space Flight Center. From 1956 to 1959, he was Senior Staff Scientist at the Convair Scientific Research Laboratory, San Diego, CA. Since 1962, he has held several important posts at Headquarters.

Students Praise Aerospace Fellowship Program

The following article under the byline of Mary Donohue appeared recently in the South Texan, published at Kingsville, TX:

"It was a fantastic job. In school, you learn theory, but out there you get to use the things you learn," observed Alfred Ramirez, one of two Texas A&I (Arts and Industrial) engineering students who worked for the National Aeronautics and Space Administration (NASA) last summer as part of a National Aerospace Fellowship program.

Ramirez, a junior mechanical engineering student, and David Solis, a sophomore electrical engineering student, hold NASA training grants for $2,500 and summer employment for two summers at any NASA installation.

"Initially, I didn't want to work for the government, but this job changed my mind. The engineers went out of their way to make sure that we got a complete picture of NASA projects," explained Ramirez, who worked in the Thermal Protection Branch at the Ames Research Center in California.

Solis, involved with computers at the Johnson Space Center in Houston, praised the center's work and added, "The government is pretty cost conscious, which really surprised me. It was a good experience to see how a government agency operates."

Both students agreed that the tone of each facility was "We want you to be happy and get into the field you want."

Solis and Ramirez worked on a number of projects in their respective fields with the aid of other engineers and reference materials.

"I had two to three weeks of reading before I could touch anything. Then I worked completely by myself on a design project, and there was an engineer I could go to if I had problems," Ramirez emphasized.

Solis, who worked at the Johnson Space Center during this summer's joint Russian-American space effort, was impressed by the efficiency of the people involved with the mission.

"There was really not that much excitement. People were going about their everyday work," he commented

The two engineering students, who will graduate in May 1977, said that it was beneficial to be involved in the whole working process of a project—from the initial design or computer program to the finished product.

"They came back from their summer jobs really charged up and enthusiastic about finishing their college studies and getting out into the working world," said Dr. Ernest A. Franke, dean of the College of Engineering.

This is the first year that A&I has participated in the National Aerospace Fellowship program, and it received two of the 50 fellowships that were awarded to students at 17 universities.

Ramirez and Solis, who were among the six to apply from A&I, were selected on the basis of academic record, personal accomplishments, study plan for the next two years, and interest in engineering and space related fields.

Purpose of the program is to encourage minority group members to undertake professional careers in scientific and engineering fields so that the space related fields will be more representative of the U.S. population.

Lift and Drag—David Solis (left) and Alfred Ramirez mount a typical aircraft wing section in the wind tunnel at Texas A&I University, Kingsville, TX, to get pressure differentials measuring lift and drag.

Dr. Fletcher Discusses the Outlook for Space Activities

"Wherever and whenever space technology can help improve the quality and security of life beneath our atmosphere, it should be applied wholeheartedly and vigorously," Dr. James C. Fletcher, NASA Administrator, said recently in a talk before the National Academy of Engineering in Washington, DC.

In opening his address, he alluded to the "exciting and spectacular" adventures of spacemen in developmental days and compared those days with today's orientation toward the solving of problems on Earth.

"These programs all have a common denominator—they are all space programs structured to provide a direct service to mankind," he added. "Their value is unquestioned, and they should and will be expanded. The very success of these and our other space programs, however, has whetted the appetite of the general public. Space technology has become a poultice for the physical and social ills of modern society.

"The often repeated question, 'If we can send men to the Moon, why can't we do this or that?', has brought the space program down to Earth in search of new energy sources, synthetic fuels, better engine design, new methods of more transportation, environmental protection and many other endeavors of a strictly terrestrial nature.

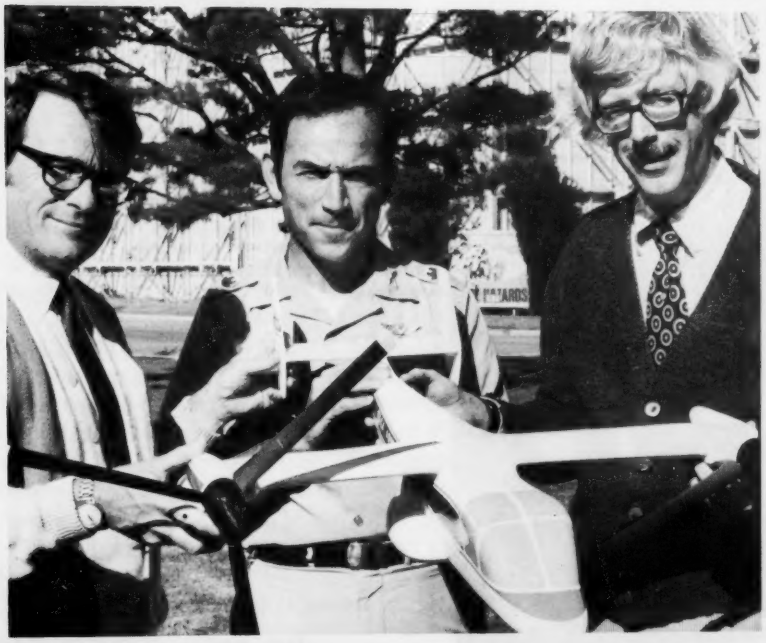
"There is nothing wrong with this per se. * * * But in concentrating on the 'now' problems we are forced to ask questions about the future: Are we losing sight of 'The Dream'? * * * We should not overlook the hidden values—the vast potential of our national space program. Unfortunately, there are few things harder to understand—and to pay for willingly—than a *potential.*"

Dr. Fletcher spoke of the incalculable value of imaginative ventures such as Charles Darwin's scientific expedition to the Pacific and its stunning results.

"Like Darwin," he said, "we have set sail upon an ocean—the cosmic sea of the Universe. There can be no turning back. To do so could well prove to be a guarantee of extinction. When a nation, or a race, or a planet turns its back on the future to concentrate on the present, it cannot see what lies ahead. It can neither plan nor prepare for the future, and thus discards the vital opportunity for determining its evolutionary heritage and perhaps its very survival. * * * We must be careful not to upset the balance between the realities of today and the promises of tomorrow. The grave problems that confront our times should not force us to haggle over the prices as though we were shopping in some ancient eastern bazaar. The danger of this mercenary approach is that we may lose sight of the incalculable rewards beyond the innermost fringe of our space goals. * * *

"Dwindling resources and contamination of the planet Earth's environment are examples of man's tunnel vision. And the blinders are still on. Our answer to the looming energy crisis is apathy. We should have been concerned about energy a quarter of a century ago. Instead we recklessly plundered a leftover treasure from the Sun as if it was unlimited. Now, we are about to pay the consequences.

"The same analogy holds true for space exploration. Unless we proceed with the same adventuresome spirit that characterized the earlier years of the Space Age,



Straight Up and Away—Project engineers for the XV-15, a tilt-rotor research aircraft that will lift vertically like a helicopter and then fly horizontally like an airplane, display a model of it in front of the wind tunnel at Ames Research Center. Left to right, they are David Few, of the Tilt-Rotor Research Project Office; Lt. Col. James Brown, U.S. Army Deputy for Test and Operations; and Kip Edenborough, Chief Engineer. The plane is now in final assembly at Bell Helicopter Co., Fort Worth, TX, and will be ready for government flight research in 1977.

tomorow's dreams will become tomorrow's problems."

The Administrator then listed some of the possible options he sees in space program planning, including: solar energy as a solution to long-range energy needs; the creation of a permanent, manned space station; implementation of new concepts such as the space colony, or habitat, recently proposed at a scientific seminar, perhaps to be followed by the establishment of larger colonies, some orbiting far from Earth; and an expansion of planetary exploration.

Continuing in that vein, Dr. Fletcher said:

"Soon one of our Jupiter spaceships, Pioneer 11, will give us our first close-up look at ringed Saturn. Next summer, Viking spaceships will land on the surface of Mars to search for evidence of life on that planet. We are currently considering a probe to distant Uranus in the 1979 time period. But what about Neptune, Pluto, and beyond? And should we consider the stars?

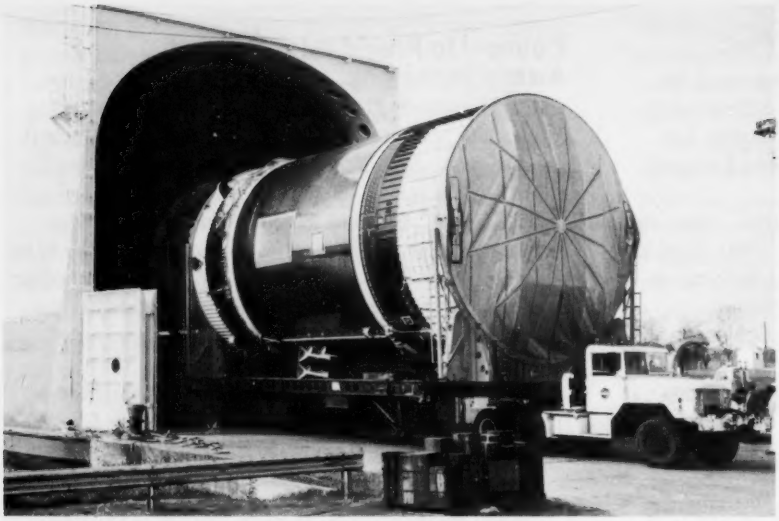
"Why not! Less than two decades ago, we were proudly pointing to a grapefruit-sized satellite in orbit. Today we are sending robot spacecraft to explore the surface of other worlds. * * * We should begin to listen to other civilizations in the Galaxy. It must be full of voices, calling from star to star in a myriad of tongues. Though we are separated from this cosmic conversation by light years, we can certainly listen ten million times further than we can travel. Some may call this nonsense, that on the scale of galactic communications, we have just reached the level of smoke signals and semaphores. No doubt this is true. The chances of success could be close to zero for our generation. But if we don't try, the chances are exactly zero. It is hard to imagine anything more important than making contact with another intelligent race. It could be the most significant achievement of this millenium, perhaps the key to our survival as a species."

Dr. Fletcher posed and answered some of the questions that might be asked about NASA's stance in the mid-1970s. He spoke of some of the constraints that can hamper the realization of goals too far in the future, not closely related to contemporary needs.

"The public, for example, is 'now' oriented," he said. "Studies—and I might add, past experience—have shown that the average person pays lip service to the kind of world he wants for his grandchildren. He is interested in what affects him now, not his descendants. * * * Selling him on the idea of financing a $100 billion space colony for the 1990s must be viewed in the same context as convincing an Eskimo that he needs a refrigerator for his igloo. * * * [but] We cannot afford to let such obstacles deter us from our ultimate goals. We must somehow keep the dreams of space exploration alive, for in the long run they will prove to be of far more importance to the human race than the attainment of immediate material benefits, just as the effects of Copernican astronomy or Darwin's Theory of Evolution far outweighed their immediate practical results. * * *

"The choice, as the historian Wells once said: 'Is the Universe or nothing.' "

Collins Honored by Southeastern University—Former astronaut Michael Collins (right), now Director of the National Air and Space Museum, recently was presented an honory Doctor of Science degree by Southeastern University of Washington, DC. He is pictured here with Frederick A. Frank, Management Analyst for NASA, who serves as Associate Dean of Undergraduate Studies and Adjunct Professor of Psychology at Southeastern.



As Backup Skylab Starts Last Voyage— Marshall Space Flight Center's backup Skylab is loaded onto the barge *Orion* at the NASA docks on the Tennessee River to begin the long trip down the Tennessee, Ohio and Mississippi Rivers to New Orleans, around the tip of Florida to the Kennedy Space Center, and north along the east coast to Washington, DC, where it will be placed in the Smithsonian Institution's new National Air and Space Museum.

5 Aerospace TV Programs Scheduled

As part of the Bicentennial Year observance, a five-part television series on aerospace topics will appear on NBC-owned stations in Chicago, Cleveland, Los Angeles, New York and Washington, DC.

In the programs, a part of NBC's public service "Knowledge" series, Dr. Walter T. Olson, Director of Technology Utilization and Public Affairs at Lewis Research Center (LeRC), and guests will depict new capabilities created since 1776 by the American people in areas such as exploring and mapping, land use and agriculture, weather forecasting, communications and transportation, energy and manufacturing, safety and health, and education and science.

The five-part series will open in Cleveland on Station WKYC (Channel 3). Programs and guests will be as follows:

Jan. 5, "After 200 Years . . . Observing Spaceship Earth," Dr. Herman Mark, Chief, Aerospace Applications Branch, LeRC; Jan. 6, "After 200 Years . . . Communicating Globally," Dr. Burton Edelson, Assistant Vice President and Director, Communications Satellite Corp., and Daniel J. Shramo, Director, Space Flight Programs, LeRC; Jan. 7, "After 200 Years—New Sources for Energy," Dr. Bruce T. Lundin, Director, LeRC, and Dr. Robert W. Graham, Head, Experimental Fluid Mechanics, LeRC; Jan. 8, "After 200 Years . . . Technology in the Service of Man," James E. Burnett, Chief, Industrial Programs, LeRC; and Jan. 9, "After 200 Years . . . the Planets Visited," Dr. George D. Sands, Deputy Project Scientist, Project Viking, Langley Research Center.

The following schedule of dates has been announced for the other cities:

Chicago, Station WMAQ (Channel 5), March 29-April 2; Los Angeles, KNBC (Channel 4), March 1-5; New York, WNBC (Channel 4), Feb. 2-6; and Washington, WRC (Channel 4), April 26-30.

Bastedo Joins International Affairs Office

Col. W. G. Bastedo

Col. William G. Bastedo (USAF, Ret.), in charge for the last year of the Ballistic Missile Systems Branch of the Defense Intelligence Agency, has joined the Office of International Affairs as Director of International Program Support.

From 1972-74, Bastedo provided liaison with NASA while on detached service with the Department of State's Office of Scientific and Technological Affairs.

Earlier, as Air Force project officer for NASA support at Western Test Range, he headed the California Tracking Station and was in charge of the NASA support ships *Vanguard, Mercury, Redstone,* and *Huntsville.* Prior to that, from 1968-72, he was detached to the Johnson Space Center where he served as remote-site Capcom for Gemini and Apollo and as a lunar mission planner.

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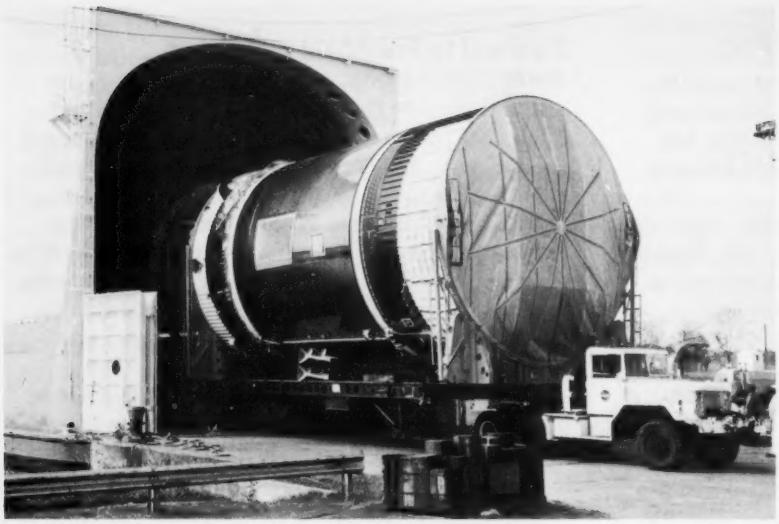
Dr. Fletcher posed and answered some of the questions that might be asked about NASA's stance in the mid-1970s. He spoke of some of the constraints that can hamper the realization of goals too far in the future, not closely related to contemporary needs.

"The public, for example, is 'now' oriented," he said. "Studies—and I might add, past experience—have shown that the average person pays lip service to the kind of world he wants for his grandchildren. He is interested in what affects him now, not his descendants. * * * Selling him on the idea of financing a $100 billion space colony for the 1990s must be viewed in the same context as convincing an Eskimo that he needs a refrigerator for his igloo. * * * [but] We cannot afford to let such obstacles deter us from our ultimate goals. We must somehow keep the dreams of space exploration alive, for in the long run they will prove to be of far more importance to the human race than the attainment of immediate material benefits, just as the effects of Copernican astronomy or Darwin's Theory of Evolution far outweighed their immediate practical results. * * *

"The choice, as the historian Wells once said: 'Is the Universe or nothing.' "

Collins Honored by Southeastern University—Former astronaut Michael Collins (right), now Director of the National Air and Space Museum, recently was presented an honory Doctor of Science degree by Southeastern University of Washington, DC. He is pictured here with Frederick A. Frank, Management Analyst for NASA, who serves as Associate Dean of Undergraduate Studies and Adjunct Professor of Psychology at Southeastern.



As Backup Skylab Starts Last Voyage— Marshall Space Flight Center's backup Skylab is loaded onto the barge *Orion* at the NASA docks on the Tennessee River to begin the long trip down the Tennessee, Ohio and Mississippi Rivers to New Orleans, around the tip of Florida to the Kennedy Space Center, and north along the east coast to Washington, DC, where it will be placed in the Smithsonian Institution's new National Air and Space Museum.

5 Aerospace TV Programs Scheduled

As part of the Bicentennial Year observance, a five-part television series on aerospace topics will appear on NBC-owned stations in Chicago, Cleveland, Los Angeles, New York and Washington, DC.

In the programs, a part of NBC's public service "Knowledge" series, Dr. Walter T. Olson, Director of Technology Utilization and Public Affairs at Lewis Research Center (LeRC), and guests will depict new capabilities created since 1776 by the American people in areas such as exploring and mapping, land use and agriculture, weather forecasting, communications and transportation, energy and manufacturing, safety and health, and education and science.

The five-part series will open in Cleveland on Station WKYC (Channel 3). Programs and guests will be as follows:

Jan. 5, "After 200 Years . . . Observing Spaceship Earth," Dr. Herman Mark, Chief, Aerospace Applications Branch, LeRC; Jan. 6, "After 200 Years . . . Communicating Globally," Dr. Burton Edelson, Assistant Vice President and Director, Communications Satellite Corp., and Daniel J. Shramo, Director, Space Flight Programs, LeRC; Jan. 7, "After 200 Years—New Sources for Energy," Dr. Bruce T. Lundin, Director, LeRC, and Dr. Robert W. Graham, Head, Experimental Fluid Mechanics, LeRC; Jan. 8, "After 200 Years . . . Technology in the Service of Man," James E. Burnett, Chief, Industrial Programs, LeRC; and Jan. 9, "After 200 Years . . . the Planets Visited," Dr. George D. Sands, Deputy Project Scientist, Project Viking, Langley Research Center.

The following schedule of dates has been announced for the other cities:

Chicago, Station WMAQ (Channel 5), March 29-April 2; Los Angeles, KNBC (Channel 4), March 1-5; New York, WNBC (Channel 4), Feb. 2-6; and Washington, WRC (Channel 4), April 26-30.

Bastedo Joins International Affairs Office

Col. W. G. Bastedo

Col. William G. Bastedo (USAF, Ret.), in charge for the last year of the Ballistic Missile Systems Branch of the Defense Intelligence Agency, has joined the Office of International Affairs as Director of International Program Support.

From 1972-74, Bastedo provided liaison with NASA while on detached service with the Department of State's Office of Scientific and Technological Affairs.

Earlier, as Air Force project officer for NASA support at Western Test Range, he headed the California Tracking Station and was in charge of the NASA support ships *Vanguard, Mercury, Redstone,* and *Huntsville.* Prior to that, from 1968-72, he was detached to the Johnson Space Center where he served as remote-site Capcom for Gemini and Apollo and as a lunar mission planner.

Rock Named Deputy Director of FRC

William H. Rock, who since 1973 has managed the Skylab and ASTP Program Office and the Sciences and Applications Office at the Kennedy Space Center, has been appointed Deputy Director of the Flight Research Center.

In announcing the appointment, E. S. Groo, Associate Administrator for Center Operations, said: "Mr. Rock's contributions to the manned flight program were recognized by NASA in awarding him the Outstanding Leadership Medal for ASTP in 1975 and the Exceptional Service Medal for Skylab in 1974."

Rock has been associated with various applications and manned flight programs at KSC since 1968. In February of this year, he took on the additional duty of Director of Information Systems.

Before going to KSC, he served both at Headquarters and at the Goddard Space Flight Center in quality assurance managerial roles. He was associated with several leading aerospace firms before coming with NASA in 1964.

Paul Cotton Named to New Position

Paul E. Cotton

Paul E. Cotton, Special Assistant to the Associate Administrator for Center Operations, has been appointed to the new position of Assistant Associate Administrator for Center Operations.

In this capacity, he will be responsible for special studies and analyses relating to institutional and organizational matters and for development of plans to implement decisions resulting from these studies. He will be expected to play a key role in the development of management systems and organization concepts, serving as the reporting point for the office of Management Planning and Review headed by James R. Elliott.

Cotton joined NASA in 1958 and since that time has served in a number of positions, including Director, Manned Space Flight Management Operations; Director, Programs and Resources Division, OART; and Special Assistant to the Associate Administrator. For two years during this period, he served as Deputy Director, Bureau of Supplemental Security Income for the Aged, Blind and Disabled, Social Security Administration, and then returned to NASA.

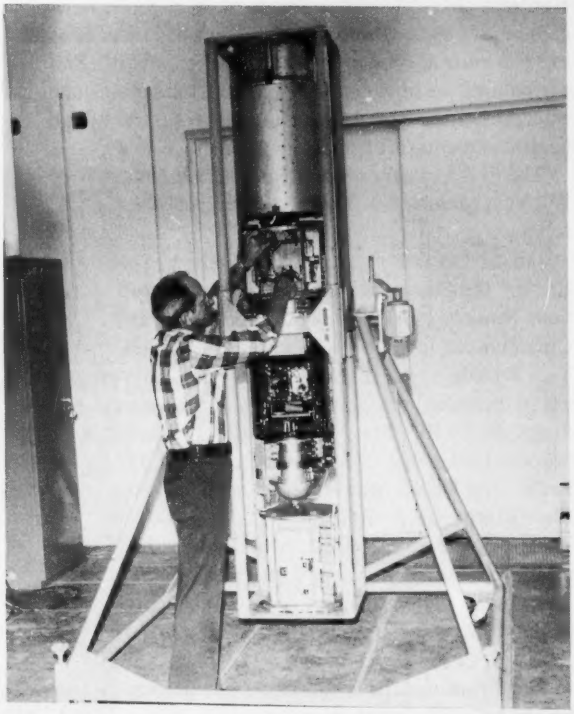
Counsel to President Speaks at Award Ceremony

The Honorable Philip W. Buchen, Counsel to and former law partner of President Ford, was the principal speaker at the Annual Awards Ceremony held recently at NASA Headquarters.

Dr. James C. Fletcher, NASA Administrator, who served as master of ceremonies, presented 161 awards to recipients from Headquarters, the various Centers, other agencies and from corporations. He was assisted in the presentation by Dr. George M. Low, Deputy Administrator.

"There are people here," Buchen said, "who have probed the Sun, flown aircraft like nothing ever flown before, saved lives and property from fire, worked with nuclear processes and laser systems, built rockets that send spacecraft to look for life on Mars, given a new

Checking Payload Before Launch—Technician Kenneth Vadasy of the Marshall Space Flight Center is shown checking the scientific experiments payload for NASA's first Space Processing Applications Rocket (SPAR) before it was launched in early December from the Army's White Sands Missile Range in New Mexico. The payload contained nine experiments involving the processing of materials in near-weightlessness. Three other such flights are planned for each year from 1976 through 1980.



dimension to the U.S.-Soviet detente and a new meaning to international cooperation.

"There are people here who have done the tough, slogging chores of management, support, and planning that have made possible the more glamorous successes. Each of you shares in the accomplishments of each other. Each of you reflects the values which give rise to mighty achievements: freedom for imagination and creativity, dedication to purpose, and excellence of performance. It is people like you who cause the rest of us to become exalted by wonderment and excitement. It is people like you who give the rest of us courage and belief in the future."

The future, he added, holds great promise. He predicted that the roles of space, aeronautics, scientific discovery, and engineering application will continue to loom large.

"You have already given the world superbly reliable and versatile launching and flight equipment, the first operational telecommunications satellites, a start toward global environmental monitoring and management," he continued. "You have already been to the Moon—and you are on your way toward the planets. You will have a major contribution to make in solving food and energy problems that beset the world. You will be opening up the routine and operational uses of space with the newly-developed Shuttle and Spacelab just as you revolutionized terrestrial transportation with the airplane. You will continue to learn, to invent, and to apply new knowledge for the betterment of our country and our world."

He cited the Intelsat system of global telecommunications by satellite as a striking example of how space technology is able to turn dreams into everyday realities from which everyone benefits. He said it also constitutes a most encouraging example of international cooperation, and recalled that 91 different countries have found it in their mutual interest to share the fruits which have resulted from the imagination and inventiveness involved.

"For these acomplishments of yours, and many more," he concluded, "we are here today to salute you who are about to receive the NASA awards for 1975 and, through you, the teammates and workers who have made your activities possible. We pay honor to you for the glory of your achievements—and we acclaim you for the sense of glory which you stimulate in every American."

Alphabetically, the awardees were as follows:

Group Achievement Awards—Aerospace Rescue and Recovery Service, U.S. Air Force; Aircraft Fuel Conservation, Headquarters and field; ASTP Atmospheric Electricity Team, Kennedy Space Center (KSC); ASTP Computing Support Team, Goddard Space Flight Center (GSFC); ASTP Public Affairs

LeRC Engineer Honored at IWY Convention—Genevieve M. Esgar (right), an aerospace engineer at Lewis Research Center, was one of six Cleveland area women honored at a convocation held recently at Cleveland State University in celebration of International Women's Year. Photographed here with U.S. Representative Martha W. Griffiths of Michigan, she was recognized for leadership in her profession and for contributions toward enhancing women's employment status.

Team, Headquarters and field; ASTP Simulation Team, GSFC; ATS-6/ASTP Operations Team, GSFC; Communications Operations Branch, GSFC.

Cryogenic Wind Tunnel Research Group, Langley Research Center (LaRC); Damage Control Branch, Wallops Flight Center (WFC); Delta Project Team, Headquarters; ERTS Geological Analysis and Image Processing Team, Jet Propulsion Laboratory (JPL); GEOS-3 Project Team, WFC; Helios Team, NASA/DFVLR (German Helios Project Team); Huntsville Operations Support Center Team, Marshall Space Flight Center (MSFC); Hybrid/Madrid Apollo Stations Team, GSFC.

International Program Policy Office, Headquarters, Language Services Division, Department of State; Low Cost Systems Office, Headquarters; NASA Public Affairs Moscow News Center Team, Headquarters; Outlook for Space Team, Headquarters and field; Pioneer 11 Saturn Mission Team, Ames Research Center (ARC); Project Antarqui On-Site Participants, WFC; Refan Project Team, Lewis Research Center, LeRC.

Shuttle Solid Rocket Booster Parachute Refurbishment Team, KSC; Small Astronomy Satellite Project Team, Headquarters, GSFC, LaRC; Project Team, Flight Center, LaRC; SPARCS Project Team, ARC; Titan Centaur Project Team, LeRC; U.S. Navy Recovery Forces CTF-130; U.S. Navy Recovery Forces CTF-140; X-24B Research Vehicle Project, Flight Research Center, FRC; and 400-KW X-Band Transmitter Team, JPL.

Public Service Group Achievement Awards—Aerospace Safety Advisory Panel; Applied Physics Laboratory, Johns Hopkins University.

Public Service Awards—Lawrence J. Adams, Martin Marietta Aerospace, Denver Division; Richard D. Bolan, Bendix Field Engineering Corp.; Charles J. Goodman, RCA Service Co.; Luis Gopequi, Institute Nacional de Tecnica Aerospacial; William H. McClennan, International Association of Firefighters; John T. O'Hagan, Fire Commissioner of New York City; Michael E. Phelps, Aeronutronic Ford; John Stults, Bendix Field Engineering Corp.; Alexis B. Tatischeff, Contract Interpreter, Department of State; Daniel Wilde, University of Connecticut; and Hobart E. Wilson, Bendix Field Engineering Corp.

Equal Employment Opportunity Awards—Alice A. Craddock, LaRC; Patsy A. Damanda, KSC; James L. Jennings, MSFC; James L. Mooney, JPL; Ronald J. Tavares, Headquarters; Ritchie H. Wilson, ARC; and Arthur Wolter, Jr., GSFC.

National Safety Council Million Mile Award—Bennie T. Wilson, WFC.

Exceptional Service Medal—Bernard G. Achhammer, Headquarters; Kenneth S. Amie, KSC; William S. Aiken, Jr., Headquarters; Joseph D. Atkinson, Jr., Johnson Space Center (JSC); Richard J. H. Barnes, Headquarters; John C. Beckman, JPL; Donald D. Blume, JSC; Robert A. Bush, MSFC; Marr Carmack, USAF Frequency Management Office; Arthur J. Carraway, KSC; Charles E. Cote, GSFC; James E. Curry, MSFC; Richard L. Daniels, Headquarters; Marlene M. Davis, KSC; Paul D. Davis, Headquarters; James D. Dean, Smithsonian Institution, National Air and Space Museum; William B. Dickinson, GSFC; Joe W. Dodson, JSC; C. Edward Doll, GSFC.

Robert E. English, LeRC; Charles E. Feiler, LeRC; Victor M. Figueroa, GSFC; Gene E. Godwin, WFC; Oceola S. Hall, Headquarters, Ellen L. Herring, GSFC; James A. Jackson, GSFC; J. Lloyd Jones, Headquarters; Richard D. Kephart, GSFC; Lauren D. King, ARC; Carl Know, GSFC; Ants Kutzer, Manager, German Helios Project; Robert C. Littlefield, Headquarters; John A. Looser, GSFC; Lt. Col. Mike V. Love, Air Force Flight Test Center; Alexander S. Lyman, Headquarters; John C. Lynn, MSFC; Robert J. MacMillan, JPL; George T. Malley, LaRC.

John A. Manke, FRC; Herman Mark, LeRC; James B. McElroy, Headquarters; John B. McKay (posthumous), FRC; D. Wayne Mooneyhan, JSC; Donald R. Mulholland, ARC; Col. George J. Murphy, USAF, SAMSO; Llewellyn W. Nicholson, GSFC; Gilbert W. Ousley, GSFC; Carl F. Pilger, Headquarters; Nelson F. Rekos, Headquarters; Phyllis W. Riggle, JPL; Robert F. Rose, JPL; Lawrence J. Ross, LeRC; Donald C. Sheppard, KSC; Robert G. Sheppard, MSFC; Ellsworth B. Simmons, Headquarters; Henry J. Smith, Headquarters; Andrew J. Stofan, LeRC.

Israel Taback, LaRC; Robert C. Tausworthe, JPL; Bernice M. Taylor, Headquarters; Robert C. Taylor, GSFC; Jerome Teles, GSFC; Charles H. Vermillion, GSFC; Joseph A. Vitale, Headquarters; Michael R. Warner, JPL; Sadie A. Weissenegger, KSC; Rundal L. Weatherington, Headquarters; Lucy C. White, LaRC; Rith I. Whitman, Headquarters; F. Dennis Williams, Headquarters; Eugene W. Willingham, II, GSFC; Paul C. Winslow, LeRC; Frank T. Wolf, WFC; Billy C. Wolverton, National Space Technology Laboratories; R. Wayne Young, JSC; Joseph A. Ziemianski, LeRC; and William E. Zorumski, LaRC.

Exceptional Scientific Achievement Medal—John D. Bird, LaRC; Brent Y. Creer, ARC; William B. DeMore, JPL; Samul Gulkis, JPL; James E. Lawrence, LaRC; Francis J. Lerch, GSFC; Howard G. Nelson, ARC; Edward P. Ney, University of Minnesota; Richard T. Schneider, University of Florida; Matthew P. Thekaekara, GSFC; Eugene W. Urban, MSFC; Edward J. Walsh, WFC; and Dell P. Williams, III, ARC.

Outstanding Leadership Medal—Robert O. Aller, Headquarters; John P. Donnelly, Headquarters; Seymour C. Himmel, LeRC; Robert N. Lindley, GSFC; Bernard Lubarsky, LeRC; John J. Neilon, KSC; Leslie H. Meredith, GSFC; Robert J. Shafer, Headquarters; and Charles H. Terhune, JPL.

Distinguished Public Service Medal—Grant L. Hansen, General Dynamics, Convair; Willis M. Hawkins, Lockheed Aircraft Corp.; and Richard B. Kershner, Applied Physics Laboratory.

Distinguished Service Medal—Robert H. Curtin, Headquarters; Donald P. Hearth, LaRC; Chester M. Lee, Headquarters; Joseph B. Mahon, Headquarters; William Nordberg, GSFC; and David Williamson, Headquarters.

Woman Scientist Tests Sounding Rocket Experiment—Dr. Mary Johnston of the Marshall Space Flight Center checks the sample container for an experiment called the "Dendrite Remelting and Macro-segregation in Zero-gravity Casting" flown on a sounding rocket flight launched in December. She and Ms. Carolyn Griner, also of MSFC, are the principal investigators for the experiment.

2 NASA Films Win 'Cindy' Awards

Two NASA films, "Jupiter Odyssey" and "Who's Out there?", earned "Cindy" awards at the annual banquet of the Information Film Producers of America (IFPA) held recently in San Diego, CA.

The awards are given annually by IFPA for the year's best information films.

"Jupiter Odyssey" is a 28-minute film produced by George Van Valkenburg Productions in California. It is the story of the 620-million-mile journey of Pioneer 10 to the planet Jupiter, telling of the findings and questions raised about the mysterious planet that were recorded by the scientific instruments and cameras on board.

With Orson Welles as host and star, "Who's Out There?", also a 28-minute film and produced by Drew Associates of New York City, is a portrayal of a contemporary scientific conclusion that intelligent civilizations exist in the Universe elsewhere than on Earth.

Accepting Film Award—Robert S. Circosta, a public affairs officer at Headquarters, accepts on the part of NASA from Lee Meriwether, former Miss America and currently a featured star in the Barnaby Jones television series, one of the "Cindy" awards presented two space films.

KSC Personnel Pledges Record CFC Total

Civil service personnel at the Kennedy Space Center pledged a record $102,029 during this year's Combined Federal Campaign, with 95.9 percent of employees participating.

Eighteen organizations went over the 100 percent mark to boost the average gift to $47.79. Launch Operations and Life Sciences both donated 152.7 percent of their goals, while the Regional Inspections Office reached 187.2 percent of its goal.

This is the third consecutive year that Federal employees at KSC have topped their goal.

Rocketry Veteran Dies

Albert Zeiler

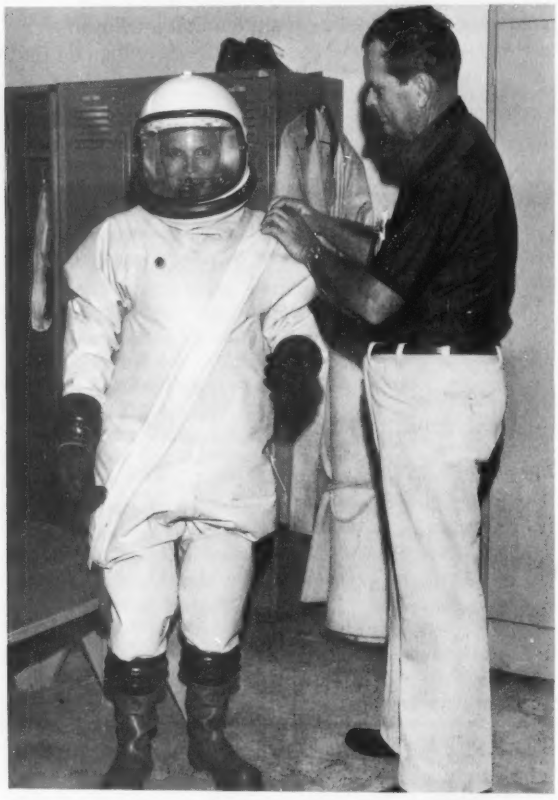
Kennedy Space Center retiree Albert Zeiler, 62, former Chief of the Mechanical Design Division of Design Engineering and a member of the German rocketry team at Peenemunde and later at the White Sands Proving Grounds, NM, died suddenly Oct. 16.

Before coming to the United States in 1946, he was involved in V-2 development and the first V-2 launch at Peenemunde. He was an engineer on assembly, checkout and launch of V-2 rockets at White Sands until 1949, when he was transferred to the Redstone Arsenal at Huntsville, AL, and became involved in early development of the Redstone missile.

Transferred to NASA with other Redstone team members, he served as Assistant Director of Facilities in the MSFC Launch Operations Directorate at Cape Canaveral and Center Coordinator for Mechanics and Propulsion in KSC Launch Vehicle Operations prior to being assigned to the engineering position.

First Female Launch Pad Troubleshooter

The costume will never win any Paris fashion awards, but Madge Trick, an attractive blonde contract employee, finds her 50-pound SCAPE (Self-Contained Atmospheric Protective Ensemble) suit is the smart thing to wear while trouble-shooting propellant problems around the



Getting Ready to Troubleshoot—Madge Trick of Pan Am Safety at KSC dons her SCAPE suit with the aid of Hal Senter of Martin Marietta.

launch pads the Kennedy Space Center uses for unmanned launches.

She is the first woman to break into a previously all-male employment field and is the first of her sex to complete toxic propellant safety training for Pan-American World Airways safety. With Pan Am in Industrial Safety for 12 years, she recently was transferred to Pad Safety where she is a supervisor trainee.

To qualify for this phase of her work, Madge underwent a rigid physical examination and was then required to take a Martin Marietta-administered course, which includes a toxic vapor lecture and SCAPE suit training.

Resembling those worn by astronaut crews, the SCAPE suit includes a 24-pound liquid air pack, boots, gloves and helmet. Thermal undergarments must be worn because of the suit's low internal temperatures.

KSC Executives Among Space Congress Officials

Two Kennedy Space Center executives will play leading roles in the Thirteenth Space Congress scheduled to be held April 7-9 at Cocoa Beach, FL.

Thomas C. Wirth, Launch Support Manager of the Space Shuttle External Tank Program for the Martin Marietta Aerospace Co., will serve as General Chairman,

Robert G. Long

Thomas C. Wirth

while Robert G. Long, Chief of KSC's Center Resources Planning and Control Office, will be Vice Chairman.

Theme of the Space Congress, a space and marine science symposium, will be "Technology for the New Horizon." It will be tied in with Bicentennial activities in Florida and throughout the nation and is sponsored annually by the Canaveral Council of Technical Societies.

V. C. (Pat) Jones, NASA ACTIVITIES Editor, to Retire

Virgil Carrington (Pat) Jones, originator of NASA ACTIVITIES and its editor since its beginning in March, 1970, will leave NASA under compulsory retirement on the basis of age Jan. 2.

He will be succeeded by Ann Weeks, who has had extensive editorial experience with COLLIERS, SPORTS ILLUSTRATED, MEDICAL ECONOMICS and NOAA's National Marine Fisheries Service. She also served as scientific editor with a National Marine Fisheries Service marine biological laboratory for four years. Presently employed in the Headquarters News Bureau, she is the author of *A History of YANK*, the Army weekly, and served as consultant on the recently-published "WWII" (see NASA ACTIVITIES, Vol. 6, No. 9).

Jones, former Manager of the Washington Public Relations Office of The Curtis Publishing Co. and

Administrative Assistant to Congressman Wm. M. Tuck of Virginia, came with NASA in January, 1969, as a professional writer. Among his assignments, he has written the first government account of the initial Moon landing, published in booklet form as "The Log of Apollo 11," and the scripts for every award ceremony held at Headquarters and the Centers since then.

Author of RANGER MOSBY, THE HATFIELDS AND THE McCOYS, GRAY GHOSTS AND REBEL RAIDERS, ROOSEVELT'S ROUGH RIDERS and other books, he began his writing career more than half a century ago.

LeRC Observes International Women's Year

The Lewis Research Center recently observed International Women's Year with a two-week program highlighted by the presentation of recognition awards to 12 of its 350 female employees.

The awardees, recognized for their outstanding contributions to the Center and to their community, include Margaret I. Alley, Rose M. Andrew, Margaret C. Appleby, Jeannette M. Biby, Gertrude R. Collins, Colleen S. Holt, Theresa A. Horvath, Marguerite G. Jereb, Gloria J. O'Donnell, Patricia M. O'Donnell, June E. Thompson and Peggy L. Yohner.

The program was especially designed to focus attention on women, although male employees were encouraged to participate. Carole R. Turoff, a columnist for the Cleveland Press and an attorney with a private law practice who serves as special counsel to the Ohio Attorney General, was the keynote speaker.

Five workshops were arranged during the two-week period and were geared to inform employees of career development opportunities available through the Federal system.

Among the Awardees—Dr. Bruce T. Lundin, Director of the Lewis Research Center, presents a recognition award to Colleen S. Holt, one of 12 LeRC women employees saluted for their contributions to the Center and their community.

Nation's Largest—Lewis Research Center was one of more than 200 exhibitors represented at the recent Greater Cleveland International Women's Year Congress, reported the largest in the U.S. this year and participated in by a number of nationally prominent women, including First Lady Betty Ford. The four volunteer workers shown here at the LeRC booth are, left to right, Marilyn Edwards, Public Information Office; Del Zatroch, Environmental Health Office; Theresa A. Horvath, Equal Employment Opportunity Office; and Mary Hartman, Educational Services Office.

Did You Know?

Spectral Scanners flown aboard aircraft from the Marshall Space Flight Center are returning data which may bring about a solution to the peach tree decline in Georgia.

In the central part of the state, site of the greatest concentration of peach orchards, trees have been dying prematurely.

Sanford Downs, Jr., agricultural specialist at MSFC, reported that data returned by the scanners revealed that some of the trees which appeared healthy when viewed from the ground actually exhibited characteristics similar to those of the diseased trees.

If the declining trees can be identified early enough, scientists say, the cause of the disease can be more readily determined and could possibly lead to the discovery of some treatment which would end the present threat to the orchards.

The Boeing Co., Kent, WA, has been selected for award of a fixed-price incentive contract to provide base modules for the first two of NASA's Applications Explorer Missions—AEM-A and AEM-B.

The ceiling price of the contract, which will be under the technical direction of the Goddard Space Flight Center, is $8,236,000.

The goal of the AEM-A spacecraft is to obtain thermal inertia data related to the Earth's surface, while that of the AEM-B mission will be to determine spatial distribution of stratospheric aerosols and ozone on a global scale.

The millionth visitor of the year has been recorded at the Kennedy Spaceport and adjacent Cape Canaveral Air Force Station—for the sixth time in seven years.

At the time, P. A. Fagnant, Chief of Visitor Activities, said: "With over two months remaining in 1975, the year's volume seems assured of approaching the 1.2 million mark. In only two previous years—1972, when total patronage was 1,389,042, and 1973, when patronage was 1,264,321—did we reach the million mark so early in the year."

In recognition of the pioneering educational television work of the Applications Technology Satellite-6 (ATS-6), an award was presented NASA by the National Association for Public Continuing and Adult Education at its recent conference in Chicago.

The award was accepted on the part of NASA by Ms. Ruth Bates Harris, Deputy Assistant Administrator for Community and Human Relations. Other awards were presented to members of the team that developed the satellite.

The Marshall Space Flight Center placed a larger percentage of contract dollars with small business during FY 75 than at any time during the last decade. Of the 8,264 contracts awarded during the year, 4,013 went to small business.

Sixteen organizations have been singled out by NASA and the Energy Research and Development Administration to negotiate contracts for development of low-cost solar cells for residential and commercial use. Twenty-two contracts totaling approximately $12 million will be awarded.

The program, known as the Low Cost Silicon Array Project, is designed to foster an industrial capability by 1985 to produce silicon solar cells or arrays at a market price of less than $500 per kilowatt capacity. The current price is $20,000 to $25,000 per kw capacity.

Today's market for solar cells is estimated to be about 100 kw annually. The projected 1985 market is 500,000.

Integrated Systems Support, Inc., of Falls Church, VA, has been chosen for the negotiation of a contract for computational support and facility operation at the Marshall Space Flight Center's Computer Complex at Slidell, LA. The contractor's proposed cost for the work is approximately $2.8 million for the first year. ■ ■ ■ ■

Transfer of Navy Employees to NSTL Is Delayed

Although both houses of Congress recently voted down floor amendments designed to stop plans to move the Navy Oceanographic Office from Suitland, MD, (in suburban Washington, DC) to new quarters at NASA's National Space Technology Laboratories in Bay St. Louis, MS, the move was delayed in December when a U.S. District Court judge ordered another halt. He asked for a new environmental impact statement.

A series of heated legal debates took place in November as the members of Congress, the NAACP and a group of Navy workers attempted to halt the transfer of some 1,200 employees. One rationale for the action was that a great many black members of the Naval office objected to relocating in the Deep South.

Proponents say the move will centralize a number of presently scattered offices, that the large NASA complex

is tenanted by several agencies whose functions complement those of the oceanographic unit, that Navy ships can be efficiently accommodated in nearby port facilities, and that the neighboring Slidell data center will be of significant assistance to the oceanographic effort.

Contracts Awarded for AMPS Studies

Two parallel contracts have been awarded by the Marshall Space Flight Center for studies of a future Spacelab payload that will investigate Earth's outer environment. Some fundamental questions that may hold the keys to man's understanding of his space environment and his effect upon it are expected to be answered.

The contracts, which total a million dollars, have been awarded to the Martin Marietta Corp., Denver, CO, and TRW, Inc., Redondo Beach, CA, for definition studies for an Atmospheric, Magnetospheric and Plasmas in Space (AMPS) Spacelab payload. The Martin Marietta contract is for $500,000 and the TRW contract is for $499,968.

The AMPS payload is planned as a scientific facility to be carried into orbit by the Space Shuttle as a Spacelab payload. It will enable scientists to carry out experiments and observations in the fields of atmosphere, magnetosphere, and space physics.

The parallel Martin Marietta and TRW studies, to be completed in 12 months, are for definition of a comprehensive AMPS systems engineering program to be integrated with ground and orbital operations of the Shuttle and Spacelab.

Satellite Locates Huge Ore Lode in Africa

The Orbiting Geophysical Observatory launched in 1964 has sent back information to the effect that along the African equator lies what may be one of the largest ore lodes in the world.

A massive magnetic disturbance has been located by the satellite in an area covering almost the entire Central African Republic. Geologists estimate it is 125 miles wide, 430 miles long and from three to 20 miles deep. Heavy metals like iron and uranium are indicated.

The discovery marks the first time since the beginning of the Space Age that a satellite has made such a finding. It may lead to the orbiting of a spacecraft to chart the Earth's magnetic field primarily.

2 KSC Women Cited for ASTP Contributions

Two Kennedy Space Center women employees—Jean Bollinger, examining supervisor in the Travel Section, and Darleen Hunt, public information assistant/specialist in the Public Information Branch—were among 35 persons presented Exceptional Service Medals for their roles in the Apollo Soyuz Test Project at an award ceremony held there recently.

Jean Bollinger

Darleen Hunt

Bollinger was cited for her outstanding work in the processing of vouchers involving KSC travel in preparation for the ASTP mission. A Civil Service employee since 1960, she has been at the Center since 1964.

Hunt received her award in recognition of her role in the successful operation of KSC's ASTP News Center. She joined NASA as a member of the KSC public information staff in 1967 and this year became the first woman to work as an Information Specialist.

Dedicating the World's Largest—The photo at left is of the 100-kilowatt wind turbine recently dedicated in ceremonies at the Lewis Research Center's Plum Brook Station. Built by LeRC for the Energy Research and Development Administration (ERDA), it is the world's largest wind energy system and the second largest ever built. Below, Dr. James C. Fletcher, NASA Administrator, is pictured at the podium as he addressed the audience. Seated, left to right, are Carl J. Wilcox, retired Chief Engineer of S. Morgan Smith Co., funder of the first wind energy project; Beauchamp Smith, who built the largest windmill ever tested; Dr. Robert C. Seamans, Jr., ERDA Administrator, who also spoke; Dr. Bruce T. Lundin, LeRC Director; Dr. John M. Teem, Assistant Administrator for Solar, Geothermal and Advanced Energy Systems, ERDA; Dr. John E. Naugle, NASA Acting Associate Administrator; and Pat Bluso, Executive Assistant to U.S. Senator John Glenn.

KSC Announces Management Shift

Reorganization of the Kennedy Space Center Launch Operations Directorate and two key appointments in preparation for the Space Shuttle era were announced recently.

John J. Neilon

George F. Page

John J. Neilon, Director of KSC Unmanned Launch Operations since 1970, was appointed Deputy Director of Technical Support. Named to replace him was George F. Page, who has been Chief of the Operations Division of KSC Spacecraft Operations since 1967.

The Launch Operations Directorate will be reorganized into four major second level groups, the first dealing with expendable launch vehicles and the others with engineering, payloads, and space transportation systems launch processing.

Key Awards

On Dec. 4, Astronaut Donald K. (Deke) Slayton accepted two awards on the part of the five members of the ASTP crews in New York City. They included the Zeta Beta Tau Richard Gottheil Medal, the fraternity's highest award presented to individuals "whose activities best promote human understanding and improve relations among all people," and the Gold Medal of the National Institute of Social Sciences, an organization designed to bring together men and women who share an abiding interest in the cultural and spiritual values of American life and who have in some substantial way contributed to the maintenance of such values.

Astronaut Gerald Carr on Dec. 5 accepted the Distinguished Citizen Award on behalf of President Ford from the "M" Club of the University of Maryland at its 25th Anniversary Banquet at College Park, MD.

The Los Angeles Area Chamber of Commerce presented its Wright Brothers International Manned Space Flight Award to the ASTP crew at a banquet at Beverly Hills, CA, Dec. 12. NASA will be represented by Astronauts Slayton and Vance D. Brand. Past recipients of this award include the Apollo 11, Apollo 15 and Skylab 2 crews.

Lunar Sample Exhibits

The following is a schedule of lunar sample exhibits from Dec. 15, 1975, to Jan. 15, 1976:

North Carolina—Our Christmas Heritage—"A Bicentennial Event"—Greensboro, Nov. 25-Dec. 27.
Texas—Houston Museum of Natural Science/History, End of Caroline at Hermann Park, Houston, Dec. 15-Jan. 15.
American Freedom Train—Los Angeles, CA, Dec. 16; San Diego, CA, Jan. 8.
High Flight Foundation-Bicentennial Mobile Space Museum—Florida, Disneyworld, Dec. 16-22, Dec. 23-29, Dec. 30-Jan. 2; Melbourne, Jan. 3-14; Sarasota, Jan. 15-18.
Tennessee Valley Association—Bicentennial Caravan Itinerary—Alabama, Muscle Shoals, Jan. 2-3; Haleyville, Jan. 4-5; Tuscaloosa, Jan. 6-7; Selma, Jan. 8-9; Monroeville, Jan. 10; Mobile, Jan. 11-14; Andalusia, Jan. 15.

Long Term Displays
Alabama—Alabama Space and Rocket Center, Marshall Space Flight Center, Huntsville.
Florida—Visitor Information Center, Kennedy Space Center.
Kansas—Eisenhower Library, 200 SE 4th Street, Abilene.
Mississippi—National Space Technology Laboratories, Bay St. Louis.
New York—United Nations Building, New York City.
Ohio—USAF Museum Wright Patterson AFB.
Texas—Johnson Library, University of Texas, Austin; Visitor Information Center, Johnson Space Center, Houston.
Virginia—Visitor Information Center, Langley Research Center, Hampton.
Washington, DC—National Geographic Museum; Smithsonian Institution, National Air and Space Museum, 1000 Jefferson Drive; Washington National Cathedral.

LRV Hardware Put to Work—A gyro and generator purchased for the Lunar Roving Vehicle navigation system are used at the Marshall Space Flight Center in an engineering model of a system that may improve coal-mining techniques. Mounted on wheels for testing and evaluation, the system will measure the curve of coal mine tunnels and thus enable operators to reduce angles before the curve becomes so pronounced that conveyor belts will not operate. James Currie (left) and Peter Broussard are shown testing the system along a curved path in an MSFC parking lot. In actual use, the system would be mounted on a skid behind a machine called a long wall shearer, which cuts coal from a deposit.

Inventions and Contributions Board Monetary Awards

The Inventions and Contributions Board, at its meetings of Jan. 23, Feb. 27 and March 27, 1975, recommended that monetary awards be granted to the NASA employees and the NASA contractor employees identified in the following list for scientific and technical contributions to space and aeronautical activities. The recommendations were approved by the Administrator and the awards have been made.

Innovator(s)	Title of Invention and Contribution
AMES RESEARCH CENTER	
Robert D. Lee	Bio-Isolated D.C. Operational Amplifier
Norman E. Sorensen	Wind Tunnel Flow Generation Section
William G. Bousman, Robert A. Ormiston, Dewey H. Hodges, David A. Peters	Hingeless Helicopter Rotor with Improved Stability
GODDARD SPACE FLIGHT CENTER	
Michael W. Fitzmaurice, Mona Tycz	Apparatus for Simulating Optical Transmission Links
JOHNNSON SPACE CENTER	
William R. Downs	Method and Apparatus for Obtaining Oxygen from Lunar or Similar Soil
Richard W. High, Herbert A. Zook	Space Flight Meteoroid Composition Experiment
Dr. Maxime A. Faget	Space Shuttle Vehicle and System
LANGLEY RESEARCH CENTER	
Howard G. Bush, John F. Crumpler, Marvin B. Dow, William M. Haraway, Jr.	Technique for Bonding
James Hamilton	Light Shield and Cooling Apparatus
Charles F. Burch	Grinding Arrangement for Ball Nose Milling Cutters
John D. Di Battista	Meteoroid Impact Position Locator
Wilbur C. Heier	Evacuated Displacement Compression Molding
David F. Putnam, Richard Vaughan	Electrolyte Cell Design
James B. Robertson	Real Time Liquid Crystal Image Converters
Ira S. Hoffman	Self-Supporting Strain Transducer
Donald L. Posey	Multi-Functional Measuring Instrument
Wesley C. Easley, William F. White, George A. Wingfield	Resonant Waveguide Stark Cell
Sherman A. Clevenson, Andrew C. Dibble, Thomas K. Lusby, Jr., Harland F. Scholl, David G. Stephens	Recording Apparatus
Kemp L. Parrish	Smoke Generator

Innovator(s)	Title of Invention and Contribution
William H. Kinard, Robert L. O'Neal	Particulate and Aerosol Detector
Donald H. Humes	Measuring Technique
LEWIS RESEARCH CENTER	
Victor S. Peterson, Robert D. Siewert	Fine Particulate Capture Device
Miles O. Dustin	Shock Position Sensor for Supersonic Inlets
Arthur S. Irwin	Drilled Ball Bearings
MARSHALL SPACE FLIGHT CENTER	
Harold Perkins	An Improved System for Imposing Directional Stability on a Rocket-Propelled Vehicle
Euple I. Palmer	Heart Simulator
Ambrose W. Byrd	Thermoelectric Power System
Herman T. Blaise, Dan H. Dane	Remote Manipulator System
James E. Johnston	Electrostatic Measurement System
James E. Johnston	Electrostatic Entrained Material Measurement System
Edwin E. Klingman, III	Apparatus for Calibrating an Image Dissector Tube
Fred Jankowski	Quick Disconnect Filter Coupling
Carroll C. Dailey	Testing Device Using X-Ray Lasers
Ann F. Whitaker	A Self-Lubricating Bearing
WALLOPS FLIGHT CENTER	
Robert T. Holdren	Radar Calibration Sphere
AUBURN UNIVERSITY	
Martial A. Honnell	Isolated Output System for a Class D Switching-Mode Amplifier
GENERAL ELECTRIC	
Thomas A. Telfer	Method of Determining Bond Quality of Power Transistors Attached to Bed Substrates
Dr. Donald A. Kugath	Remote Manipulator System
HONEYWELL	
D. J. Walker	Flame Detector Operable in Presence of Proton Radiation
JET PROPULSION LABORATORY	
Philip A. Clements	A System for Stabilizing Cable Phase Delay
George C. Gilley	Shared Memory for a Fault-Tolerant Computer
MARTIN MARIETTA	
James A. Loomis	Device to Prevent Clogging in a Hopper
McDONNELL DOUGLAS	
J. E. Turnage, R. M. F. Linford, S. D. Cornish	Flame Detector Operable in Presence of Proton Radiation
MONSANTO RESEARCH CORPORATION	
James A. Webster	Ether-Linked Aryl Tetracarboxylic Dianhydrides

Innovator(s)	Title of Invention and Contribution
OHIO STATE UNIVERSITY	
Carl A. Mentzer Leon Peters, Jr.	Horn Antenna Having V-Shaped Corrugated Slots
RESEARCH TRIANGLE INSTITUTE	
Jimmie J. Wortman Robert P. Donovan Arthur D. Brooks Larry K. Monteith William H. Kinard Robert L. O'Neal	Particulate and Aerosol Detector
ROCKWELL INTERNATIONAL CORPORATION	
Ralph F. Kuhn	An Internally Supported Flexible Duct Joint
George Alers Otto Buck Richard V. Inman Harris L. Marcus	Method and Apparatus for Detecting Flaws in Elongated Bodies
YOUNGSTOWN STATE UNIVERSITY	
Dr. Allen J. Zuckerwar	Instrumentation for Measurement of Aircraft Noise and Sonic Boom

First Shuttle Ground Equipment—The first Space Shuttle operational ground support equipment manufactured for the Kennedy Space Center was delivered recently to Flight Research Center for use in preliminary testing before going to KSC. A 111,000-pound towing tractor to move NASA's Boeing 747 carrier aircraft, the Orbiter, or the 747 with mated Orbiter, is a production model now in use at many jetports. It is shown here as it was driven by KSC's Don Burris during accceptance testing at Sturgeon Bay, WI.

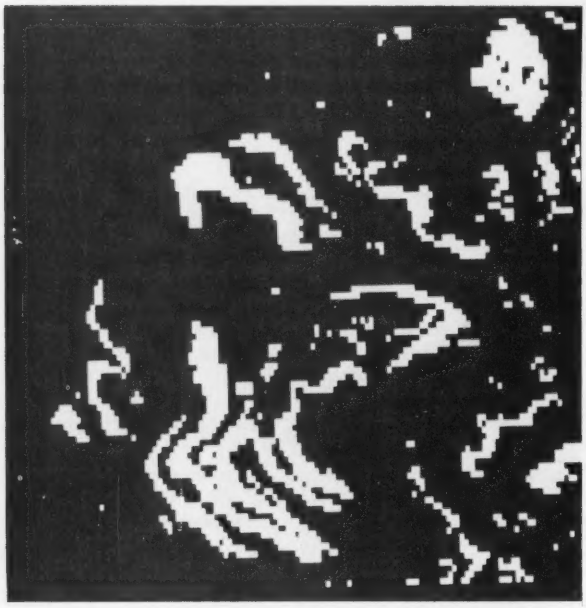
New American Legion Committee Chairman—Noah L. Smalley, Chief of the Planning Branch in Supply and Transportation, a division of the Kennedy Space Center's Installation Support Directorate, has been appointed Chairman of the American Legion's National Aerospace Committee, which performs a major role in informing the public and Congress of the importance to the nation of aviation and space programs. A career government employee who has been with KSC since 1964, he completed 30 years of Federal service on Dec. 5.

Projected Launch Schedule

(As of Nov. 28, 1975)

Name	Launch Date	Vehicle	Range	Mission Remarks
CTS-A	Jan. 13	Delta	ETR	Canadian-US cooperative experimental communications satellite to develop and test the technology of high power satellite communications systems.
Helios-B	Jan. 15	Titan III Centaur	ETR	Second West German/NASA cooperative satellite to investigate the properties of and processes in interplanetary space close to the Sun.
Intelsat IVA-B	Jan. 29	Atlas Centaur	ETR	Second of a series of improved Intelsat Constortium satellites. Reimbursable.
NATO-IIIA	Feb. 12	Delta	ETR	Communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
ITOS-E2	Feb. 19	Delta	WTR	Operational meteorological satellite of the National Weather Service to provide daytime and nighttime cloud cover imagery. Reimbursable.
RCA-B	March 24	Delta	ETR	Second domestic communications satellite for RCA. Reimbursable.
Comstar-A	March	Atlas Centaur	ETR	Domestic communications satellite for Comsat Corp. Reimbursable.
Marisat-A	April	Delta	ETR	Comsat Corp. satellite to provide maritime communications services. Reimbursable.
LAGEOS	April	Delta	WTR	Demonstrate relevant space techniques that will contribute to the development and validation of predictive models for earthquake hazard alleviation, ocean surface conditions and ocean circulation.
Relativity (Gravity Probe)	May	Scout	WTR	Scientific probe to make a test of Einstein's Theory of Relativity.
Air Force	May	Scout	WTR	USAF Scientific Payload, Reimbursable.
Marisat-B	May	Delta	ETR	Second Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
Comstar-B	May	Atlas Centaur	ETR	Second domestic communications satellite for Comsat. Reimbursable.

Name	Launch Date	Vehicle	Range	Mission Remarks
Navy Transit	2nd Qtr.	Scout	WTR	Navy navigation satellite. Reimbursable.
Indonesia-A ..... (Palapa)	July	Delta	ETR	Indonesian communications satellite. Reimbursable.
NATO IIIB	August.....	Delta	ETR.....	Communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
ITOS-H	4th Qtr. ...	Delta	ETR	Operational meteorological satellite to provide daytime and nighttime cloud cover imagery for NOAA. Reimbursable.
RCA-C	October	Delta	ETR	Third domestic communications satellite for RCA. Reimbursable.
GOES-B	November ..	Delta	ETR	Second operational satellite to provide continuous daytime and nighttime global cloud cover observations for NOAA. Reimbursable.
Marisat-C	December ..	Delta	ETR.....	Third Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
Intelsat IVA-C	December	Atlas Centaur.	ETR	Third of a series of improved Intelsat Consortium satellites. Reimbursable.



Land Features Scanned—Strip mines (light portions) are clearly displayed in this adaptation of imagery collected by LANDSAT-1 scanners from an altitude of 500 nautical miles above western Maryland. Computer assisted multispectral analysis of LANDSAT satellite digital data resulted in surface area measurements of 858 square kilometers (331 square miles) of Maryland's mining regions, with an accuracy of 93 percent.

This illustration and others are the result of a cooperative attempt by the Goddard Space Flight Center, the General Electric Space Division and the State of Maryland's Bureau of Mines to determine the extent to which LANDSAT computer processed data can identify, classify and measure strip-mined areas. The LANDSAT data will be useful to the State's field surveyors in their effort to locate and measure strip mines and carry out reclamation projects.

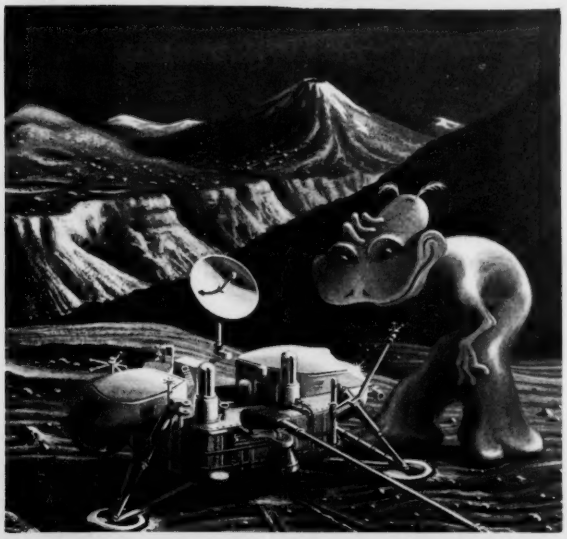
Results of the study are described in the recently issued publication "Monitoring Surface Mines from Space" by Arthur T. Anderson of GSFC and Dorothy T. Schultz and Ned E. Buchman of the General Electric Co., Beltsville, MD.

Patents for Inventions from NASA Research

(The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel for the indicated installation.)

Inventor(s) and Employer(s)	Title and NASA Docket	Patent No.	Installation
Edward L. Shriver, NASA/MSFC David W. Jex, NASA/MSFC Eduard B. Igenbergs, Natl. Academy of Science, Washington, D.C.	Two Stage Light Gas-Plasma Projectile Accelerator (MFS-22,287-1)	3,916,761	MSFC
Leonard Weber, McDonnell Douglas Corp., Santa Monica, CA	Prevention of Hydrogen Embrittlement of High-Strength Steel by Hydrazine Compositions (NPO-12,122-1)	3,919,014	NaPO
Donald J. Bottoms and Theofanis G. Gavrillis, Martin Marietta Corp., Denver, CO	Turnstile and Flared Cone UHF Antenna (LAR-10,970-1)	3,919,710	LaRC
Murat H. Kural, Lockheed Missiles and Space Co., Inc., Sunnyvale, CA	Strain Arrestor Plate for Fused Silica Tile (MSC-14,182-1)	3,920,339	JSC
James R. Lowery, NASA/MSFC	Panel for Selectively Absorbing Solar Thermal Energy and the Method of Producing Said Panel (MFS-22,562-1)	3,920,413	MSFC

Recognized for Service—C. Guy Ferguson (center), who has served on the Inventions and Contributions Board longer than any other NASA employee—from December, 1958, until he resigned from the Board in July, 1975—recently was presented a Certificate of Appreciation "for his dedicated and conscientious service." Photographed with him at the presentation are Frederick J. Lees (left), Board Chairman, and Frank W. Kemmett, Director of the Board Staff.



The British Touch—David A. Hardy of Birmingham, England, one of the world's leading space artists, adds a humorous touch in this sketch of an imaginary lunar scene, which appeared on the cover of the November issue of THE MAGAZINE OF FANTASY & SCIENCE FICTION. He has in mind other antics for the character here depicted, including a ride on the Lunar Rover left by Apollo 15 and perhaps a hitch on Pioneer 11 as it passes Saturn.

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A New Cost-Saving Sewage Treatment Process

The old method of treating sewage—in which about 40 percent of the solid waste material remains in the wastewater and thus is discharged into the Nation's rivers and offshore waters—is on its way out. In its stead will come a new method from space technology that almost entirely eliminates solids and, at the same time, cuts down on costs:

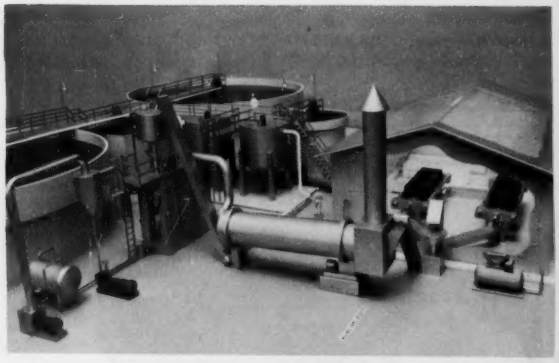
The discoverer of the new process is Marshall Humphrey, a chemical engineer at the Jet Propulsion Laboratory. In the course of testing materials in search of a lightweight rocket motor insulator, he built a pyrolysis unit for manufacturing activated carbon. Tests revealed that sewage solids made an excellent raw material for the production of the carbon used to treat raw sewage.

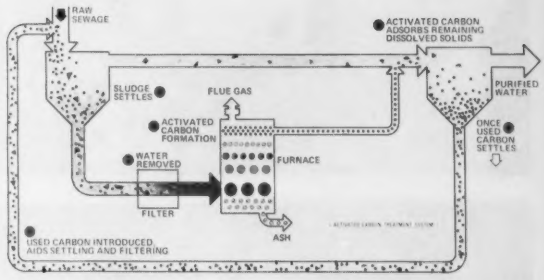
The key to the system Humphrey worked out is a pyrolytic reactor (the horizontal cylindrical unit in the center of the table model shown at left) that converts solid sewage material into activated carbon, which then is used to remove impurities from the incoming wastewater. The "used" carbon is recycled back with new sewage solids and reactivated. Moreover, gases generated from sewage solids are used as a source of power.

A mobile demonstration unit was built by JPL and operated successfully at the Orange County sewage facility in California. Experiments indicated the following results:

1. Virtual elimination of sewage solids.
2. Cleaner wastewater delivered to the ocean.
3. Removal of heavy metals contained in the sewage.
4. Elimination of odors.

A new 1,000,000-gallon-a-day municipal pilot plant, with 100 times the capacity of the mobile unit, is now under construction at Huntington Beach, CA, midway between Los Angeles and San Diego, and will go into operation during 1976. It was funded by the Environmental Protection Agency, Orange County Sanitation Districts, and the State of California.





The new plant is intended to determine the design requirements for still larger treatment facilities for use of the new technique in processing sewage to meet pending federal environmental standards. Compared to the old method of treatment, capital costs are expected to be reduced by at least 25 percent.

NASA

National Aeronautics and
Space Administration

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